AMENDMENTS TO THE SPECIFICATION:

- *Please replace the paragraph at page 1 lines 10-17 with the following:*

  Quaternary phase shift keying (QPSK) is a method of amplitude-modulating a data stream $d_k(t)$ into orthogonal in-phase $d_I(t)$ and quadrature $d_Q(t)$ data streams onto the cosine and sine functions of a carrier wave. The pulse stream $d_I(t)$ amplitude-modulates the cosine function with an amplitude of +1 or −1. This is equivalent to shifting the phase of the cosine function by 0 ~~or □~~ or π, producing a binary PSK waveform. The pulse stream $d_Q(t)$ similarly modulates the sine function and yields a binary PSK waveform orthogonal to the cosine function. The summation of these two orthogonal data streams of the carrier wave yields the QPSK waveform.

- *Please replace the paragraph extending from page 10 line 16 to page 11 line 1 with the following:*

  The error signals are derived from the reconstructed waveform by correlating the delayed sample 76 with the derivative with respect to carrier phase of the conjugate of the reconstructed waveform for the phase error, or the derivative with respect to time of the conjugate of the reconstructed waveform for the timing error. The real part of the complex result is the error signal. For CPM, wherein the waveform is represented generally by ~~s(t)=exp{j[□₀t+□+□ (t-□, □)]} (wherein □₀ is the carrier frequency, □ is the carrier phase relative to the receiver, and □ (t-□, □) is the excess phase of the signal)~~ $s(t) = \exp\{j[\omega_0 t+\theta+\psi(t-\tau, \alpha)]\}$ (wherein ω_0 is the carrier frequency, θ is the carrier phase relative to the receiver, and $\psi(t-\tau, \alpha)$ is the excess phase of the signal), the derivative with respect to carrier phase of the conjugate of the reconstructed waveform is j multiplied by the conjugate of the reconstructed waveform. For CPM, the conjugate of the reconstructed waveform is equivalent to subtracting the reconstructed phase, so the error is j times the real or the imaginary part of the result shifted by the reconstructed phase. The derivative with respect to time is the derivative with respect to phase multiplied by the derivative of the phase command (the phase figure 62) with

respect to time. These derivatives are stored in the lookup table 60. Because alternate bit phase values are complemented in the above procedure, alternate bit phase derivatives are inverted at an alternate bit inverter block 72. Using the above procedure, the block in Figure 2 labeled lookup table 60 represents both the lookup table itself and the above operations on the phase command (the phase figure 62) extracted from the lookup table.

- *Please replace the two consecutive paragraphs extending from page 11 line 29 to page 12 line 17 with the following:*

It is a feature of GMSK modulation that ~~dΘ/dt~~ <u>dθ/dt</u> inverts on every Q bit. Since the register 58 operates on alternating I and Q bits, a combination alternate bit switch 64 and ~~compliment~~ <u>complement</u> block 68 are imposed as shown to correct the sign of the Q bits (which are inverted for GMSK as above). The phase figure 62 (for example, the n^{th} bit which corresponds to the most recent data bit in the register 58 being an in phase bit) passes directly through the alternate bit switch block 64 without modification. The alternate bit switch block 64 then switches to receive the next succeeding phase figure (for example, the $n^{th}+1$ bit which corresponds to the most recent data bit in the register 58 being a quadrature bit) from the ~~compliment~~ <u>complement</u> block 68. The alternate bit switch block 64 receives only one input at an given instant, alternating between an input directly from the lookup table 60 and an input from the ~~compliment~~ <u>complement</u> block 68. Since the example n^{th} bit was an in phase bit, the next succeeding $n^{th}+1$ bit is necessarily a quadrature component. The quadrature $n^{th}+1$ reconstructed phase passes through the ~~compliment~~ <u>complement</u> block 68, which takes the ~~compliment~~ <u>complement</u> of the phase (one quarter cycle minus the phase) for the quadrature bits. The alternating bit switch block 64 thus alternates its output between inphase and quadrature bits. This allows the same lookup table 60 to be used at the in-phase and quadrature bit times.

The adder 70 takes as inputs the phase estimate ~~62~~ from the lookup table 60 (the phase estimate being either the phase figure <u>62</u> for the I bits or the

~~compliment~~ complement of the phase figure 62 for the Q bits), and a phase offset from the phase loop filter 80. Adding these two inputs at the adder 70 yields a reconstructed phase correction.

- *Please replace the two consecutive paragraphs extending from page 13 line 16 to page 14 line 13 with the following:*

As noted above, phase and timing error in a CPM waveform are related. The present invention provides that timing correction may be made with the same lookup table 60 that was used for phase correction. Along with the phase figure 62, the lookup table 60 also outputs a symbol tracking signal 66. Preferably, the symbol tracking signal 66 is the time derivative of the phase, ~~d□/dt~~ dϕ/dt. In this manner, a single, relatively abbreviated lookup table 60 may be used to generate both outputs, phase figure 62 and symbol tracking signal 66. Where the symbol tracking signal 66 is the time derivative of the phase ~~d□/dt~~ dϕ/dt, a feature of continuous phase modulation (CPM) is that every time derivative of phase ~~d□/dt~~ dϕ/dt that corresponds to a quadrature bit has an inverted sign (+ or -). In phase error correction, this was compensated by taking the ~~compliment~~ complement of the Q related phase figure 62. In timing error correction, this is compensated by passing every time derivative related to a Q bit through an alternate bit inverter 72. In short, every derivative corresponding to an I bit passes unchanged through the alternate bit inverter 72, and every derivative corresponding to a Q bit passes through the alternate bit inverter 72 with only its sign (+ or -) changed. The output of the alternate bit inverter 72 is a (sign corrected) ~~weighing~~ weighting factor that is dependent upon the bit pattern stored in the register 58 at the time the relevant bit *k* first entered the register 58. This ~~weighing~~ weighting factor (the output of the alternate bit inverter 72) is input into a multiplier 74, which is part of the timing loop.

The timing loop comprises the timing adjust block 50, the delay circuit 76, the loop phase shifter 78, the multiplier 74, and a timing loop filter 82. Along

with the output of the alternate bit inverter 72 as detailed above, one other input to the multiplier 74 is the output of the loop phase shifter 78, also detailed above. The output of the loop phase shifter 78 is a delayed version of the received signal that is phase compensated. Since the output of the alternate bit inverter 72 is just a ~~weighing~~ weighting factor, the multiplier applies that ~~weighing~~ weighting factor to the output of the loop phase shifter 78 to result in a timing offset signal. The timing offset signal that is output from the multiplier 74 is then passed through a timing loop filter 82, which filters out undesirable high frequency components, and input into the timing adjust block 50. There, the filtered timing offset signal is used to adjust the timing of the received CPM signal.